# CHAPTER 3.10
# VEGETATIVE COVER LAYER AND EROSION CONTROL

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3.10-1. GENERAL. Vegetative cover plays a key role in controlling erosion by shielding the topsoil from precipitation, holding soil particles together, and reducing the velocity of runoff. Well-developed vegetation also consumes subsurface water between rainfall events through evapotranspiration. For landfill cover applications, vegetation should be chosen based on the following criteria:

- Locally adapted, perennial plants resistant to droughts, temperature extremes, and other local climatological extremes;
- Root systems which do not disrupt the infiltration layer and create pathways for percolation;
- Ability to thrive with a minimum of nutrient additions;
- High enough plant density to minimize soil erosion; and
- Low mowing and maintenance requirements.

a. Equipment. Check the specifications to determine if there are any requirements for pesticide application equipment, seeding equipment, or mulching equipment. Additional information is available in Volume 1 of the Quality Assurance Representative's Guide, in the chapter titled "Establishing Grass and Plant Material".

b. Preconstruction Submittals. The contractor should provide preconstruction submittals as required by the specifications. The following is a list of typical submittal requirements.

(1) Pesticides application plan including manufacturer's information discussing physical characteristics and application instructions for pesticides.

(2) Seed analysis.

(3) Lime analysis.

(4) Fertilizer analysis.

(5) Pesticide analysis.

(6) Soil tests for topsoil. Tests may include pH, organic content, particle size, nutrient analysis, and mechanical analysis.

3.10-2. SEEDING AND TURF PROTECTION.

a. Seeding Times and Conditions.

(1) Ensure that specified planting periods are adhered to.

(2) Work should be stopped if unsatisfactory conditions exist for planting. Examples of unsatisfactory conditions include excessive moisture and drought.

b. Site Preparation.

(1) Ensure that finished grades are completed prior to planting. Finished grades should be free of stones and debris and should be protected from vehicles and erosion.

(2) Seeded surfaces should be graded to transition smoothly to areas undisturbed by construction.

(3) Soil amendments such as lime and fertilizer should be applied at rates determined by topsoil analysis or as recommended in the specifications. Lime and fertilizer are often incorporated as part of the tillage operation.

c. Seeding.

(1) Immediately prior to the start of seeding operations, ensure that the equipment to be used is calibrated correctly.

(2) Seeding is often performed using two passes with each pass off-set 90 degrees from the other. Each pass should apply seed at half the rate specified.

(3) Ensure mulching is performed the same day as seeding. Check the specifications to see if mulch should be disced into the soil or if hydromulch should be used.

(4) Pesticides should be applied by a state-certified applicator (where applicable).

d. Protection and Maintenance of Turfed Areas.

(1) Ensure that the area is protected against traffic immediately after mulching operations have been completed.

(2) The turf establishment period should be stated in the specifications. Contact the designer if it is not.

(3) The definition of a satisfactory stand of turf should be stated in the specifications. Contact the designer if it is not.

(4) Ensure that the contractor performs maintenance of the turfed areas, including eradicating weeds, protecting embankments and ditches from erosion, maintaining erosion control materials, protecting turfed areas from traffic, and mowing (if specified).

(5) Ensure that damaged, eroded, or barren areas are re-established by the contractor, including repair or replacement of mulch.

(6) Terms for measurement and acceptability of turf should be stated in the specifications. Contact the designer if they are not.

3.10-3. SURFACE DRAINAGE/EROSION CONTROL. Landfill erosion control structures are designed to reduce soil erosion by minimizing the velocity of surface water and concentrating flows into protected channels. Prevention of erosion requires temporary erosion control protection and continuous maintenance until the permanent vegetative growth is established. Permanent erosion control systems such as benches, terraces, channels, and drainage ditches may also be required.

a. Benches and Channels. Benches and channels are permanent

erosion control structures that carry surface water from the landfill cap to sedimentation basins. Perimeter berms may also be needed to divert storm water from surrounding areas away from the landfill.

(1) Ensure that materials used (rip-rap, geotextiles, bedding soil) meet specified requirements.

(2) Verify benches and channels are constructed to the cross-sections and grades indicated on the plans and specifications.

(3) Visually inspect for dips and reverse grades along bench and channel bottoms.

(4) Ensure that the contractor is disposing of or reusing the excavated material in accordance with the specifications.

(5) Ensure soils used to construct benches are placed at the specified moisture content and compacted to the specified density.

(6) For channels at the toe of a landfill cover, verify the outlet pipes for the cover drainage layer are not obstructed or damaged during construction of the toe channel.

b. Gabions. Gabions are welded wire fabric structures that enclose rip-rap and hold it in place. They are used as permanent erosion protection for channels.

(1) Ensure that basket wire, lacing wire, and stone fill are as specified.

(2) Ensure that the foundation is prepared as specified. Inspect the foundation surface for smoothness immediately prior to placing the filter fabric.

(3) Ensure that the gabions are placed at the slopes and elevations called for on the drawings.

(4) All adjoining empty gabion units should be connected by wire lacing along the perimeter of their contact surfaces. Ensure that lacing is accomplished as described in the specifications.

(5) The initial line of gabion baskets should be anchored by partially filling them.

(6) Verify that stone filling operations proceed by careful placement by hand or machine so welded wire fabric structures are not damaged and to assure a minimum of voids between the stones.

(7) Along all exposed faces, the outer layer of stone should be carefully placed and arranged by hand to ensure a neat and compact appearance. The last layer of stone should be leveled with the top of the gabion to allow for proper closing of the lid and to provide an even surface that is uniform in appearance.

(8) Ensure that lids are stretched tight over the stone fill using crowbars or lid closing tools until the lid meets the perimeter edges of the front and end panels. The lid should be tightly laced with tie wire along all edges, ends, and internal cell diaphragms by continuous stitching. Ensure that all projections or wire ends are turned into the baskets.

(9) Do not allow the use of clip connections for the purpose of

final lid closing.

(10) Where a complete gabion unit cannot be installed, the basket should be cut, folded, and wired together to suit existing site conditions. The mesh must be cleanly cut and the surplus mesh cut out completely, or folded back and neatly wired to an adjacent gabion face.

c. Grout Bags. Grout bags are sometimes used to armor steep channels to resist erosive flow velocities. Specifications and manufacturer's directions should be consulted for installation instructions.

(1) Ensure grout bags are not pulling out of the anchor trenches as the bags are filled with grout.

(2) Ensure grout bags are fully expanded with grout.

(3) Excess grout on the edges of the anchor trench should be removed.

d. Sedimentation Basins. Sedimentation basins are impoundments constructed to collect surface runoff and control its release to prevent adverse impacts to adjoining properties and receiving waterways. Construction of sedimentation basins is similar to construction of other earthen embankments. Additional information is available in Volume 2 of the Quality Assurance Representative's Guide in the chapter titled "Levee Construction and Earth Embankment Construction for Dams".

e. Silt Fences. Silt fences are made of woven geotextile fabrics which are resistant to deterioration due to ultraviolet light and heat exposure. The geotextile is attached to wooden stakes using metal staples.

(1) Verify the silt fence meets the specified material requirements.

(2) Ensure the silt fence is securely fastened to the wooden stakes. Typically, a minimum of 3 staples should be used to attach the silt fence.

(3) Ensure that silt fence is installed where indicated by the plans and specifications. However, try to be flexible in the placement location so that areas where trenching will be difficult can be avoided.

(4) Verify the bottoms of the silt fence is buried to the depth indicated on the plans and specifications (typically, 150 to 200 mm (6 to 8 inches)). The geotextile should be positioned on the uphill side and the stake to the downhill side of the trench.

(5) The trench should be backfilled so that at least 50 to 100 mm (2 to 4 inches) of the silt fence geotextile forms a "J" shape, with the lower portion of the "J" pointing uphill. The trench should be backfilled and the soil compacted over the geotextile so it is level with the surrounding grade.

(6) Check the silt fences at least once per month for damage or excessive silt accumulation. Additional inspections should be made after large rainfalls and high winds.

f. Hay Bales. Hay bales serve the same function as silt fences.

(1) Verify that bales are tied firmly with wire or plastic ties and are secured by wood stakes.

(2) Verify bales are partially buried and staked in accordance with the specifications.

g. Erosion Control Blankets. Erosion control blankets provide temporary protection from erosion until the vegetative cover can be established. They are typically made of interlocking wood fibers or knitted straw. These materials are covered on both sides with a biodegradable plastic mesh or interwoven thread. As the vegetative cover becomes established, the erosion control blanket biodegrades and disappears.

(1) Verify that the area to be covered is properly prepared, fertilized, and seeded before the erosion control blanket is applied. All ground surfaces should be relatively smooth so that the erosion control blanket lies in complete contact with the underlying soil.

(2) Biodegradable erosion control blankets are very sensitive to water and ultraviolet light. Make sure these materials are stored in dry conditions and protected from sunlight until needed.

(3) Ensure that the weight and type of the blanket is as specified. If the erosion control material has defects or damage, it should be rejected or repaired prior to use.

(4) If the material is to be repaired, torn or punctured sections should be removed by cutting a cross section of the material out and replacing it with a section of undamaged material.

(5) Ensure overlaps are shingled in the direction of flow.

(6) Verify ends and edges of the erosion control blanket are pinned tightly to the ground so water cannot flow beneath the blankets and cause erosion.

(7) Ensure that staples used to hold the blanket in place are as required in the specifications. The staples should be applied vertically, keeping the blanket taut.

(8) Make sure staples are not so long that they penetrate the cover soil and damage underlying geosynthetics.

(9) Check the specifications and manufacturer’s recommendations for overlap and pin placement requirements. The following can be used as general guidance:

- Adjacent rolls of erosion control material should be overlapped a minimum of 75 mm (3 inches);
- Staples should secure the overlaps at 750 mm (2.5 ft) intervals;
- Roll ends should overlap a minimum of 450 mm (18 inches); and
- The end overlaps should be stapled at 450 mm (1.5 ft) intervals.